

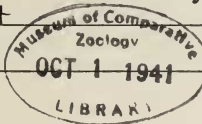
# THE WILSON BULLETIN

A QUARTERLY MAGAZINE OF ORNITHOLOGY

Published by the Wilson Ornithological Club

13,814

Vol. 53



SEPTEMBER, 1941

No. 3

## THE BREEDING OF THE BLACK OYSTER-CATCHER

BY J. DAN WEBSTER

THE four thousand mile coast line along which the Black Oyster-catcher (*Haematopus bachmani*) ranges includes many very different types of country but the littoral marine invertebrate fauna of the exposed shores of this area is remarkably uniform (Webster, 1941). The Sitka region, where the present study was made, is one of high precipitation and mild, even temperature. High mountains (2,500 to 4,000 feet) front the Pacific Ocean, buttressed at their feet by rocky islands and capes. From sea level to 2,500 feet luxuriant coniferous forests clothe all in green.

Five pairs of Black Oyster-catchers nested on Kayak Island in 1940, and here a large part of the observations were made. Kayak Island (Figures 1 and 2) is actually a group of islands, of which all but the most southerly, "S E Rock," are united at low tide. The location is two miles southwest of the town of Sitka, in the eastern part of



Figure 1. Kayak Island from the east.

Sitka Sound. Although the dry-land size, according to the chart, is 160 by 460 yards, these dimensions must each be increased about 60 yards to express the size in calm weather at mean low water. On all sides the shores are precipitous and rocky. The invertebrate fauna of the wide seaward shore is chiefly the "association" of *Mitella polymerus*, *Pisaster ochraceus*, and *Mytilus californianus*. On the landward, eastern shore the vegetation grows down nearly to the high tide line. Here the littoral fauna is of the semi-exposed type—chiefly *Acmea scutum*, *Balanus glandula*, *Strongylocentrotus franciscanus*, and *Cribina xanthogrammica*. The vegetation of the island is a dense growth of shrubbery and conifers; around the borders, and all over barren S E Rock, hardy clusters of rock buttercups (*Potentilla villosa*) and a few grasses withstand occasional salt spray, in crannies of the basalt. The pinnacle of S E Rock is only twenty-five feet above mean low water; on this barren rock three pairs of Oyster-catchers and two pairs of Pigeon Guillemots (*Cephus columba*) had their nests. The Guillemots and Oyster-catchers, however, completely ignored each other.

The Black Oyster-catcher's nest is usually (Dawson, 1923) of one of five types:

- (1) A platform or bowl of rock flakes in a cranny of the bare rock.
- (2) A hollow scraped from a soil pocket in an irregularity of the rock and lined with bits of shell and rock flakes. Later in the summer grass grows up around the nest (Figure 4). This type is particularly common as a play nest, built several days before egg laying.
- (3) A hollow scraped from weedy turf on a ledge several feet above spray line, and lined partially with rock flakes. One nest of this kind was found which had been dug through the shallow soil two inches to the ledge beneath, which formed a solid rock bottom on which the eggs lay.
- (4) A bowl of grass or dried moss, similar to a gull's nest.
- (5) A hollow scooped from unmodified beach gravel. Not found near Sitka.

The nest is built high enough to escape the flying spray of summer gales. This meant from 5 to 21 feet above mean high water—which was 7.7 feet above mean low water at Sitka—varying with the surf exposure of the site. The preferred site is the top of an isolated rock with no trees—only sparse vegetation. There is usually shelter from the prevailing winds.

The earliest and latest egg dates I recorded—a full clutch of four eggs on Kayak Island, May 9, 1940, and an egg hatching on Kayak Island on August 6 or 7, 1940—are beyond any recorded in literature, although Willett (1909) records a set taken May 14, "About half incubated." The eggs are deposited at intervals of from one to three days; incubation commences about one day after the deposition of the last egg. Of thirteen first sets examined, five consisted of two eggs

each, seven of three eggs each, and one of four eggs, an average of 2.69 eggs per clutch. Of three second sets, one consisted of one egg and two of two eggs each, an average of 1.67 eggs per clutch. Removal of eggs by Ravens (*Corvus corax*) did not stimulate the laying of additional eggs unless the entire clutch was stolen. Zerlang and Fraser (1940) report the finding of a five-egg clutch laid by a single hen. On S. E. Rock, the writer found that the territories (See figure 2) of two pairs

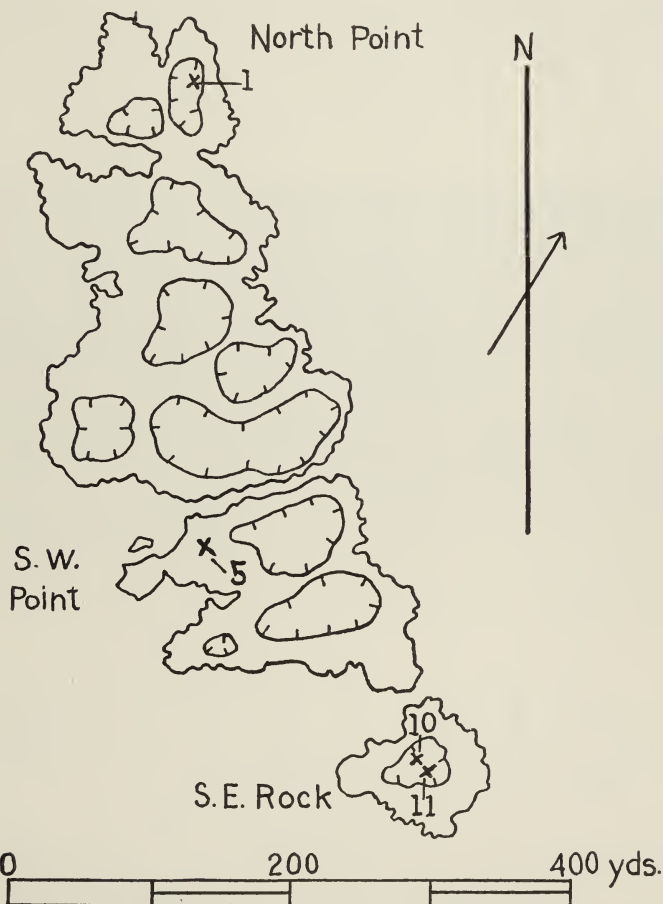


Figure 2. Kayak Island. The inner contour lines represent winter high tide line. Black Oyster-catcher nests are indicated by crosses.

of Oyster-catchers overlapped. The two hens laid in the same nest (Figure 4); one hen four eggs before May 9 and the other, evidently, two before May 17. Three of these occupying birds were shot by

poachers before observations could be made on incubation. The remaining bird (sex not known), belonging to the later-laying pair, incubated the eggs until they were destroyed on June 16.

The incubation period was observed to be 27 days in one case. Other determinations were: Not over 26 days; 26 or 27 days; 27 to 30 days. Dirksen (1932) found that the incubation period of the European Oyster-catcher (*Haematopus ostralegus*) varied from 25 to 34 days, averaging 27 days.

In winter Black Oyster-catchers are found in flocks of from two to more than fifty individuals. (The latter large flock—"over fifty birds"—was seen by George Willett at Sea Otter Harbor, Dall Island, Southeastern Alaska, in 1920. Personal communication). The Sitka Bay flock observed during 1940 ranged chiefly around the Indian River flats mussel beds and a group of rocky islets including The Twins and a headquarters rock nicknamed "Cormorant Rock." They bred over an area three miles square.

In early March there were twelve birds in the flock and several wandering pairs; definite territorial behavior was first noted in five pairs of Oyster-catchers on Kayak Island on March 22. From March 28 to April 26 there was a marked correlation between the height of the tide and the number of birds in the flocking territory. At low tide there were never more than four present; at high tide, no matter what the time of day, the number present was from six to ten. This shows a tendency in the present species like that noted in April in Holland by Huxley and Montague (1925). There the pairs of inland-breeding European Oyster-catchers gathered on the flocking grounds during the late afternoon, slept there, then went on the breeding territories during most of the day. But in the case of the Black Oyster-catcher, a marine species, the flocking period was at high tide.

By May this flock had been reduced, by the desertion of breeding birds, to two birds which were seen several times on or near Cormorant Rock throughout the summer; they usually fed on the Indian River mussel beds. They never showed territorial behavior as exhibited by nesting birds and I regarded them as non-breeding yearlings, although on May 7 they did perform a switch-back chase.

In mid June two other Oyster-catchers, evidently the pair which had deserted territory on the MacClelland Island, a mile away, joined the two on Cormorant Rock, and thus formed the carry-over from the previous winter's flock and the nucleus of the 1940-41 winter flock. These MacClelland Island birds may have been immatures—that is, Oyster-catchers in their second spring—because they established territory, built nests, but never laid eggs and abandoned their nesting place very early. Dirksen (1932) gives good proof that Oyster-catchers do not ordinarily breed until their third spring.

On July 25 the flock had increased to eight by the addition of more



unsuccessful nesters. At this time, however, many more birds, having lost their chicks, were wandering around in pairs and small flocks, sometimes reverting to their nesting territories, sometimes joining the main flock. By August 19 the flock consisted of all of the Oyster-catchers from the area, save for one very late nesting pair with their chick. This flock, consisting of twenty-two adults and two juveniles, was observed until September 5.

Piping was never observed in the flock during July or August, but it was noted during March and April. The flock's general schedule consisted of a period of resting and sleeping during high tide, crowded together on Cormorant Rock, then feeding, scattered out over a half-mile or so, on the rocks or flats on the latter part of the ebb and the



Figure 3. Flock of Black Oyster-catchers on Cormorant Rock at high tide. Note the two juveniles at the far right.

early part of the flood tide. When the Oyster-catchers had eaten their fill, they returned to Cormorant Rock to preen and sleep. An alarm when the flock was scattered soon brought them crowding together, in flight or on a single rock or point.

The actual territory claimed by each pair of Oyster-catchers varies considerably; as Buxton (1939) notes, tidally exposed rocks, which are particularly valuable for feeding, are included in the territory.

The bird not incubating sometimes flies to the distant feeding ground. In this case Indian River flats was a feeding ground for all birds within two and a half miles. However, as soon as the chicks are hatched this practice is discontinued and the bird not brooding or feeding the chicks remains within call. When the bird not incubating is not foraging, it stands on the lookout on some eminence of rock, at a distance of from five to twenty-five yards from the nest. This lookout

post is not invariably the same, but one place is used more often than any other by each pair of birds. Often this lookout post is the same spot used as a refuge when their nesting place is invaded. But the lookout position, it is noticeable, is never at a greater elevation than the nest, although such places are often available.

Behavior of Oyster-catchers when their nesting territory is invaded by man varies somewhat. Before the eggs hatch, a loud, shrill call is given continuously—*kee, kee, kee, kee*—while the birds stand on their refuge, or fly from the opposite side of the observer to the refuge and back. Often the birds attempt to lead the intruder away, running along in a semi-crouching position with the nape feathers raised and ruffled and the tail lowered (Shortt, 1939). Frequently an Oyster-catcher watches an observer from behind a rock, so that only part of the bird's head can be seen peeping over the rock. After the chicks are hatched the behavior of the parents differs in that a new call—*keek-a-keek, keek-a-keek*, or, *keek, keek, kee-akee-ooo*—is introduced, most often being given as the parents fly near the crouching chicks. In one case, however, —on the Eckholms,—a certain bird used this other call each time it was visited, even shortly after the eggs were laid. When the human invader has left and can be seen still going away at a distance of about 150 yards from the nest, the Oyster-catchers give an "All clear" piping ceremony—sometimes in unison, sometimes one alone. In the latter case the other bird, which is already approaching the nest or chicks, does not answer verbally, merely pecking the ground or bowing once. Occasionally this piping is reduced to a single note—an all clear call—which is the same as the opening note of a piping ceremony. This note, reiterated, is sometimes used by a lookout bird as it flies from one perch to another, apparently to tell its mate its location. It is lower in tone and less shrill in quality than the alarm call.

The Black Oyster-catcher is very bold in defense of its nest, intruding birds being attacked and struck until driven away. According to my observation a Raven steals eggs by watching from a nearby tree until both Oyster-catchers are away from the nest in a piping ceremony or chasing away a second Raven. The Raven then swoops suddenly down to the nest, spears an egg, and flies off with the booty. Bald Eagles are blamed for the loss of many chicks; Raven for the loss of nearly all eggs laid in certain areas. The following birds were noted being chased away from the nesting territory: Bald Eagle, Glaucous-winged Gull, Hudsonian Curlew, American Raven, and Northwestern Crow. Crows and gulls were tolerated on the feeding areas of the territory, but were driven off when they approached closer than twenty-five yards from the nest. Sparrows, guillemots, and small shore birds were ignored.

Other Oyster-catchers are sometimes driven off but more often are "bowed off" in a piping ceremony which is nearly always given on land.

In various circumstances, two or more Oyster-catchers standing near

each other point their bills vertically downward, opening them slightly, extend their necks, hunch their shoulders forward, and erect their nape feathers. A series of loud, high-pitched, sharp notes is given, *Kewik, kewik, kewik, kwik, kwik, kwik, kwirrr*, gradually becoming closer-spaced, then running into a trill which slowly dies out in intensity. During this time, the hunched-forward attitude is retained and the entire body is bobbed up and down.

Early in the spring piping ceremonies are frequent at the boundaries of territories, with four birds taking part. The most common piping ceremony observed was of three birds, when one extraneous bird entered the territory of a pair. Often this occurred while the observer was rowing away, and the previously alarmed pair, which had called a third bird over to join in hurling maledictions at the human intruder, edged the foreign Oyster-catcher away in a more or less extended bowing trio that replaced the usual "All clear" duet or solo. Soon the third bird flew off to his own territory. Following are the field notes of a case of this kind observed on Kayak Island on June 10, from a blind ten feet from nest 1 (See map):

E and F were the birds holding the nest near the blind. If Buxton [1939] was right in believing that only the hen clucks, then E was the cock, F the hen. A was the non-incubating bird from nest 5, 300 yards away.

3:10 P.M.—David\* left the blind. At least two of the three eggs were pipped and the chicks were peeping. F was fifteen yards northwest of the nest with A; E was twenty-five yards southeast of the nest.

3:17—E flew to join A and F when David disappeared 250 yards to the south. F began piping, facing A, as E landed parallel to her and a few inches away. E immediately joined F in piping, the two bowing alternately, and walking, slowly, stiffly west, away from the nest. A postured and bowed, did not pipe, walked out of sight behind a boulder.

3:22—A flew off west. E and F flew to the lookout, twenty-five yards southeast of the nest.

3:24—F flew to a point below the nest, and fifteen yards east.

3:26—F rapidly flew and walked to the nest, crouched; fluffed feathers and wiggled for quite a while; the peeping of the chicks ceased.

3:35—E moved up to a point fifteen yards east of the nest, stared at the blind.

4:00—E left to join other oyster-catchers which could be heard giving the alarm call on the other end of the island.

4:07—E returned, landed ten yards north of the nest.

4:15—I made a loud noise in the blind, frightening F from the nest. As F landed beside him, E began bowing and the two gave a piping ceremony ten yards north of the nest.

Sometimes piping is given in flight by a group of four or more birds; in such case the bill is pointed straight downward, but the shoulder-hunching and bowing are absent. "When the piping is given in flight a peculiar form of flight is used; the flapping is swift but the forward progress is slow" (Buxton, 1939). According to Dirksen

---

\* My brother David acted as assistant, helping me in many ways. Thanks are also extended to Dr. Arthur A. Allen and to countless other friends and councilors at Sitka and at Ithaca.

(1932), these piping flights do not begin until ten days before the eggs are laid, and disappear by the time the first eggs hatch. I observed this "flight piping" ("Flugbalz" of Dircksen, 1932) several times on Kayak Island. The piping birds circled the island, the lookout bird of each pair joining the group as it passed and flying with it. Usually the incubating bird pecked the ground, a sign of excitement; sometimes it left, to pipe with the others. Probably this performance is an expression of social excitement. One particularly noteworthy fact is that the larger the piping group, the longer the excitement lasts and the more intense the excitement appears (See Huxley and Montague, 1925).

Performances in which only two birds take part are common. Usually the ceremony begins when one bird, which has been at a distance, flies to its mate and lands beside it. The stationary bird begins piping as it watches its mate land, then both bow and pipe together. The ceremony is self-exhausting and afterward the birds resume their normal activities (i.e., preening, sleeping, feeding, or incubating).

Huxley and Montague (1925) observed a type of flight which they called "Butterfly flight"; Dircksen (1932) also observed this in May. It consisted of a lazy floating flight, with slow wingbeats of large amplitude. Never was this behavior seen at Sitka, nor was the "Flutter flight" of Dircksen observed. This latter involved wing movement of very small amplitude.

During May especially, Black Oyster-catchers frequently indulge in the "Switchback chase" described first by Huxley and Montague (1925). Two birds fly low over the water, one in close pursuit of the other. Now and again the pursued bird, followed by the other, rises into the air, skidding on to one side; then they side-slip diagonally down and continue their pursuit. Sometimes a mated pair indulges in this flight, although this is not common. On one occasion, July 12 on Mahknati Island, the female (proved by subsequent collection) of the invaded territory pursued an invader of an unknown sex (whose mate was also invading the territory) for a long time in a switchback chase. Finally, after a circular and figure-eight course of at least two miles had been traversed, the pursued bird landed on a rock one quarter mile distant. The pursuer landed with him, but very soon returned to her breeding territory. Soon after the other invading bird rejoined its mate. Incidentally, the male of the territory was dead, having been shot just before this episode.

Late in the summer (on August 6) a pair which was flying on a straight route between islands was noted to side-slip occasionally, as though partially reverting to the switchback chase of a few weeks before.

Courtship in oyster-catchers is peculiar in involving no special preliminary or subsequent ceremony. I observed the act only once—on March 22, 1940. The cock flew onto the hen's back from a distance,



half extended his wings for balance, and finally hopped off. The hen turned her head to look at the cock on her back. After the performance, neither of them having uttered an audible sound, both began preening and dozing as though nothing had occurred.

"As with so many birds, the oyster-catcher has the habit, in certain moments of excitement, of pecking at the ground, and at small straws on the ground in a curious, aimless and excited manner" (Huxley and Montague, 1925). On the nest this is particularly noticeable when the brooding bird is distrustful of the observer's camera or blind; it nibbles and pecks at straws and blades of grass. Huxley and Montague noted pecking at the ground, "Occasionally, after the close of a piping performance; occasionally, after coition; occasionally, when males or pairs on adjoining territories were close to each other in a state of nervous tension. Nervous tension is also characterized by bobbing." Bobbing, or bowing, is also a sympathetic action when a bird hears or sees other individuals at some distance in a true piping performance.

Despite a recent statement to the contrary (Lack, 1940), there is good evidence that oyster-catchers remain mated for life: (1) The writer has always observed Black Oyster-catchers segregated into pairs, even when flocking. This observation seems to check with those of other ornithologists, for example, Michael (1938). (2) Dirksen (1932) once saw a complicated offering ceremony, and once a fight between two cocks. The simple absence of other such observations indicates that the mating ceremony is so infrequent as to occur but once in the lifetime of each oyster-catcher. (3) Dirksen recorded a case in Germany in which a pair of banded oyster-catchers nested for seven successive years in the same spot.

During the ten days to two weeks preceding egg laying, Black Oyster-catchers usually build several "play nests," which are in most cases inferior in construction to the nest finally used. Which sex does the actual work of carrying the rock flakes, often from a distance as great as fifty yards, is not known. On the single occasion when actual nest building was observed, the hen was arranging the nest just after deposition of the first egg, and the cock was feeding. At any rate, nearly always construction of the final nest is not begun until a very few hours before deposition of the first egg. The hen squats on the nest but a short time in deposition—not long enough to warm any other egg which may be present.

The nest lining (Buxton, 1939 and Dirksen, 1932) is added to in two ways. The brooding bird often absent-mindedly nibbles and arranges with its bill, and once in a while brings a decoration such as a rock or shell from a distance.

At the first alarm call from the lookout bird, the incubating bird rises, then flies on a circular course to join its mate. (See Dawson, 1923). Alarm calls from Oyster-catchers 300 or more yards away cause

the incubating bird to merely cock its head in interest, as it does when Crows caw angrily nearby. Incubation is not left to the heat of the sun, as I learned by long observation on one of the hottest days of the year (80°F.) at Sitka. The birds covered the eggs closely all day.

Observations of nest 5, Kayak Island, on May 30 from a point seventy-yards north of the nest show the schedule followed by the pair. In general, the lookout bird put its bill under its scapulars for a two or three minute period, looked about for five minutes or so, then put its bill under its scapulars again. Such observations are omitted below.

- 12:55—Both birds on S W Point, fifteen yards south of the nest as I walked to the blind; both gave a few alarm calls.  
12:59—Both alert; A preened.  
1:05—B gave a single all clear call.  
1:06—B flew to a point of rock eight yards south of the nest.  
1:08—B flew to the nest, squatted.  
1:32—A looked up, walked a few feet nearer nest, to the regular lookout spot.  
1:34—Two oyster-catchers piped on S E Rock; both A and B cocked their heads, listened; A pecked the ground.  
1:55—A looked up, shook tail, preened, stood alert.  
2:00—A flew down to the rock just north of S W point, which was just well clear of the receding tide, began feeding.  
2:05—B looked up from the nest; A looked up every half minute or so while feeding.  
2:16—A flew up, circled my blind twice, flew out of sight through the crevice to the east. B looked up from the nest.  
2:20-2:22—Piping on S E Rock; presumably A had invaded territory.  
2:23—A returned to S W Point from the south.  
2:24—Eighteen minutes before low tide. B flew from the nest, flew 100 yards straight out to sea (southwest), turned, flew at an altitude of fifty feet back to S. W. Point, landed on the rock pinnacle six yards west of A; bowed and piped; A bowed but did not pipe.  
2:26—A flew to twelve yards south of the nest.  
2:27—A flew to the nest; B flew to Crevice Rock, stood alert.  
2:29—A squatted; B flew to seventy-five yards north of the nest, landed near the water's edge, crouched on rock.  
2:42—Tide at low point.  
2:49—B flew north, soon returned with E (from nest 1); the two circled my blind, then flew back north, E leading.  
2:51—B returned alone.  
2:52—B resumed feeding.  
2:55—B flew to the lookout spot on S W Point, walked around, shook its head.  
3:10—B preened at length.  
3:15—B walked to far side of S W Point, out of sight.  
3:37—Piping on S E Rock—A looked up from the nest, pecked the ground.  
3:41—B flew up, calling several times, circled the nest, landed eight yards south of the nest.  
3:44—B put its bill under its scapulars.  
3:59—I left.

On June 11 the changing-over of this pair was again observed. This time the incubating bird left the nest just four minutes after the

tide had turned and flew directly to a point near its mate on S W Point. Both bowed and piped; then, after two minutes of inactivity, the other bird began moving toward the nest. These cases, together with stomach analyses of specimens taken and the fact that many hours of observation at high and middle tides failed to record a change of incubating bird, have led to the formulation of the following theory: A pair of Black Oyster-catchers change places on the nest very near the time of



Figure 4. Nest 10, Kayak Island, with six eggs laid by two hens.

each low tide; that is, every twelve hours. Possibly this routine is changed if the birds are disturbed.

The parent Black Oyster-catchers are careful and anxious. During the first day or day and a half the chicks are brooded almost continuously; then for one week commonly; during the second and third weeks only when it is raining; after that not at all. The offer of cover includes a clucking note, similar to that given by the incubating bird as it squats down on the eggs. Whether both sexes cluck, however, is not certain. When there is danger near, the old birds give their special cry and the chicks crouch until the all clear signal is given.



Routine is the same as during incubation. One parent stands guard and feeds himself while the other feeds the chicks (and, probably, eats a little); then they change off at the turn of the tide and the second parent stands watch or eats while the first feeds the chicks. During high tide, one bird stands near the chicks or covers them and the other stands at some distance, usually at a greater elevation than its family.

Behavior of young European Oyster-catchers was analyzed in detail by Dewar (1920) and his work should be read for a full understanding of the progress of the young birds.



Figure 5. Black Oyster-catcher incubating.

By the third day the chick can run well and swim expertly; it can scramble over large obstacles, and fall from a veritable precipice without injury. The wings are frequently exercised until actual flight begins in the fifth week.

In a chick just out of the shell, with down still wet, crouching is readily induced but does not last long, and the chick struggles when seized. By the fourth day the chicks spread out at the parent alarm, and crouching persists even on handling. Toward the end of the second week crouching is maintained even in an inverted position, and may last for an hour and a half. The chick raises its head at this age when



the parents cease calling for a few seconds, if the danger is not visible, and then lays its bill on the rock again as the old bird flies overhead, calling loudly. In the fourth week crouching is often supplemented by hiding in vegetation, and in the seventh week tends to be replaced by flight.

Preening begins about the fifth day of the chick's life, and about the same time the bill, when soiled, is wiped on the plumage. In the fifth week the chick commences to rest on one foot and sleep with the bill under the scapulars.



Figure 6. Black Oyster-catcher one week old. Note the egg tooth.

Feeding begins on the second day, when food is brought by the parents to a point near the nest and offered in small fragments which are pointed out. The parents bring limpets and chitons and those mussels which are torn entire from the rock to the chick and clean them from the shell there. Barnacles, of course, are brought in the flesh. Disposition of mussels when the chick is not near the foraging place and the shells cannot be torn from their anchorage (See Webster, 1941.) is not certain. Probably most mussels opened by the foraging bird are eaten immediately rather than carried to the chick. It may be, however, that only mussels with the ventral border up are taken when the chick is not following, and those few can be opened, torn loose and cleaned near the chick. The chick does not follow the foraging parent until the

third to fifth week, depending on the difficulty of descent to the feeding areas. By the fifth day the chick picks insects off vegetation or rocks. At least by the thirtieth day it can neatly remove limpets and mussels from their shells—a complicated process; but chitons are too tough for it until the sixth week. In the fifth week the chick probes tentatively at the mussels, with little success; not until it is three or four months of age can it open mussels and barnacles rapidly and remove chitons and limpets from the rocks. Williams (1927) records adults obtaining food for young chicks as late as November 3.

Excitement or alarm are indicated from the sixth day onward by bobbing and tapping the ground. From the thirteenth day onward satisfaction is shown by sidewise wagging of the tail after feeding.

Observations of fledged chicks were few, but two banded young which had often been studied before fledging, were found again on August 10, at the age of 57 days, two miles from the nest. Dircksen (1932) and Buxton (1939) record a shift of territory as chicks move before learning to fly. The calls of these juveniles were at this time, as they continued for another month, more shrill than those of the adults, but they were given similarly—that is, a steady flow of alarm notes, which were run together in more rapid succession just as the bird took wing. The parents were much alarmed, but did not hover close to the young, one of which let the observer row within ten yards before flying. The juveniles' path of flight followed that of the parents. These two juveniles joined the flock at high tide as early as their sixty-seventh day, but held somewhat aloof (See figure 3). At low tide, of course, they followed their parents to be fed.

One juvenile was kept in captivity from her thirty-fifth day until her sixtieth. When mussels were opened several feet from her cage, she gave two or three squeaky, expectant calls. It was found that 120 large mussels per day were necessary for continued growth.

During spring and early summer of 1940, a census was made of the Black Oyster-catchers in eastern Sitka Sound, that is between Point of Shoals and Whitestone Narrows on the north and Kita Island on the south. There were found to be 26 non-breeding birds, presumably sub-adults, and 76 breeding birds defending territory. This is on a linear strip of about twenty-five miles. In early September a careful survey of ten miles of this strip, which had contained 62 Oyster-catchers, showed that they had for the most part gathered into flocks. One flock of 24 birds, including two juveniles, ranged around Cormorant Rock, The Twins, and Indian River flats. A second flock of 24 birds, including three juveniles, roamed the rocks and islets near Povorotni Point, seven miles south of Sitka. Further southwest, 10 birds, of which four were juveniles, occupied the rocks just northeast of Kita Island where they had bred. And on Kayak Island, one pair still had an

unfledged chick. The total was 51 birds in adult plumage and 10 juveniles. Four of the eleven missing birds had been collected by the writer; at least four had been shot by poachers.

With data on 84 pairs of nesting European Oyster-catchers on the island of Norderoog, in the North Sea, Dirksen (1932) calculated that the life expectancy of a fledged young is eight and three-fourths years. He trapped one breeding bird which had been banded as a juvenile on the island nineteen years before.

Figures obtained by the writer at Sitka give an average life span of about seven years by the same method, as follows:

Twenty-four breeding pairs raised ten young in one year.

A pair of adult birds would therefore, raise two young in five years.

Five plus two and three-fourths (the age at which the young first breed) equals seven and three-fourths years, average life span of fledged young. If two of the three juveniles collected had instead been fledged—a probable figure—then this life span would be six and three-fourths years.

Of the total of 133 museum specimens examined of Black Oyster-catchers more than four weeks of age, there were 68 females, 64 males, and one not sexed. This suggests a sex ratio of 1.06:1.00.

#### SUMMARY

The incubation period of the Black Oyster-catcher is usually 27 days. During the winter Oyster-catchers congregate in flocks which are scattered at low tide for feeding and crowded together at high tide for resting and sleeping. The breeding territory of a pair of Oyster-catchers contains important feeding places; it is defended from April to August. Both male and female incubate, changing places each low tide. The non-incubating bird, when not feeding, stands guard near the nest. The piping ceremony variously expresses sexual excitement, territorial jealousy, or social excitement. Pecking at the ground and bowing indicate nervous emotion. Parents caring for chicks exchange places each low tide; one cares for the chicks for twelve hours, then feeds and stands guard for twelve hours.

#### LITERATURE CITED

BUXTON, E. J. M.

1939 The breeding of the Oyster-catcher. *British Birds*, 33:184-193.

DAWSON, W. L.

1923 The Birds of California. South Moulton Co., Los Angeles (pp. 1346-53).

DEWAR, J. M.

1920 The Oyster catcher's progress toward maturity. *British Birds*, 13: 207-213.

DIRCKSEN, ROLF

1932 Die Biologie des Austernfischers, der Brandseeschwalbe und der Küstenseeschwalbe nach Beobachtungen und Untersuchungen auf Norderoog. *Jour. f. Ornith.* 80:427-85.

HUXLEY, JULIAN and F. A. MONTAGUE

- 1925 Studies on the courtship and sexual life of birds. V. The Oyster-catcher (*Haematopus ostralegus* L.). *Ibis*, 1925:868-897, pl. 27.

LACK, DAVID

- 1940 Pair-formation in birds. *Condor*, 42:269-86.

MICHAEL, CHARLES W.

- 1938 Black Oyster-catchers at Point Lobos. *Condor*, 40:125-6.

SHORTT, T. M.

- 1939 The summer birds of Yakutat Bay, Alaska. *Contrib. Royal Ontario Mus. Zool.*, 17:12-13.

WEBSTER, J. D.

- 1941 The feeding habits of the Black Oyster-catcher. *Condor*, 43:175-80.

WILLETT, GEORGE

- 1909 Bird Notes from the Coast of San Luis Obispo County. *Condor*, 11: 185-7.

WILLIAMS, LAIDLAW

- 1927 Notes on the Black Oyster-catcher. *Condor*, 29:80-81.

ZERLANG, L. and T. FRASER

- 1940 A large set of the Black Oyster-catcher. *Condor*, 42:264.

NEWARK, CALIFORNIA